

#2119

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re U.S. Patent Application of
SUGINO et al.



Art Unit 2651

Application Number: 10/784,796

Filed: February 24, 2004

For: STORAGE CONTROL SYSTEM STORING
OPERATION INFORMATION

Atty Docket No. WILL.0008

Honorable Assistant Commissioner
for Patents
Washington, D.C. 20231

COVER LETTER

Sir:

The below-identified communications are submitted in the above-captioned application or proceeding:

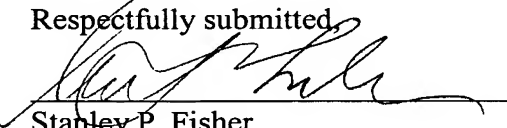
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|---|---|---|-------------------------------------|
| <input checked="" type="checkbox"/> [x] | Petition to Make Special under 37 CFR §1.102(d) for Accelerated Examination | <input type="checkbox"/> [] | Terminal Disclaimer |
| <input type="checkbox"/> [] | Substitute Specification | <input checked="" type="checkbox"/> [x] | Information Disclosure Statement |
| <input type="checkbox"/> [] | Assignment | <input checked="" type="checkbox"/> [x] | Statements & Pre-exam search report |

☐ [] Please charge my Deposit Account Number _____ in the amount of _____ to cover the fees for _____. A duplicate copy of this paper is enclosed.

☒ [x] A check in the amount of \$130.00 to cover the petition fee is enclosed.

☒ [x] The Commissioner is hereby authorized to charge any additional fees associated with this communication, or credit any overpayment to Deposit Account Number 08-1480.

Respectfully submitted,


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April 26, 2005

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Art Unit 2651

PETITION TO MAKE SPECIAL UNDER 37 C.F.R. § 1.102(d)

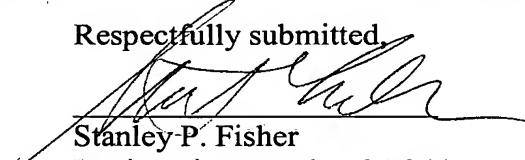
FOR ACCELERATED EXAMINATION

Sir:

Pursuant to 37 C.F.R. § 1.102(d), Applicants respectively request that the application to be examined on the merits in conjunction with the pre-examination search results, the detailed discussion of the relevance of the results and amendments as filed concurrently.

Substantive consideration of the claims is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicants' undersigned representative at the address and telephone number indicated below.

Respectfully submitted,


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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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BUGINO et al.

Application Number: 10/784,796

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OPERATION INFORMATION

Atty Docket No. WILL.0008

Art Unit 2651

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STATEMENTS & PRE-EXAMINATION SEARCH REPORT
SUPPLEMENTAL TO
THE PETITION TO MAKE SPECIAL

Sir:

Pursuant to 37 C.F.R. §§ 1.102 and MPEP 708.02 VIII, Applicants hereby submit that (1) all claims of record are directed to a single invention, or if the Office determines that all the claims presented are not obviously directed to a single invention, will make an election without traverse as a prerequisite to the grant of special status; (2) a pre-examination search has been conducted according to the following field of search; (3) copies of each reference deemed most closely related to the subject matter encompassed by the claims are enclosed; and (4) a detailed discussion of the references pointing out how the claimed subject matter is patentable over the references is also enclosed herewith.

FIELD OF THE SEARCH

The field of search was directed toward:

Class Subclasses Description

709/ ELECTRICAL COMPUTERS AND DIGITAL
 PROCESSING SYSTEMS:
MULTICOMPUTER DATA
TRANSFERRING OR PLURAL PROCESSOR
 SYNCHRONIZATION

212 COMPUTER-TO-COMPUTER DIRECT MEMORY
 ACCESSING

	220	NETWORK COMPUTER CONFIGURING
	224	. Computer network monitoring
	229	. Network resources access controlling
	231	. Computer-to-computer data streaming
<u>Class</u>	<u>Subclasses</u>	<u>Description</u> (continued)
710/ DATA INPUT/OUTPUT		ELECTRICAL COMPUTERS AND DIGITAL PROCESSING SYSTEMS:
	22	. Direct Memory Accessing (DMA)
711/		ELECTRICAL COMPUTERS AND DIGITAL PROCESSING SYSTEMS: MEMORY
	111	.. Accessing dynamic storage device
	112	... Direct access storage device (DASD)
	118	.. Caching
714/ FAULT		ERROR DETECTION/CORRECTION AND DETECTION/RECOVERY
	9 Access processor affected (e.g., I/O processor, DMA processor)
MMU,	32	... Particular stimulus creation

The search was conducted to identify prior art relevant to claims 1-7 of U.S. Application 10/784,796. The claims as generally characterized by a storage control system which is connected to a host apparatus and a maintenance terminal, the storage control system comprising: one or more channel adapters to be a communication interface with respect to the host apparatus; one or more host data storages in which data from the host apparatus is stored; one or more disk adapters to be a communication interface with respect to the one or more host data storages; one or more operation information storage memories in which operation information of the storage control system is stored; and a memory connection section for connecting the maintenance terminal to the operation information storage memory, wherein one or more channel processors are mounted to the respective channel adapters, one or more disk processors are mounted to the respective disk adapters, the respective channel processors and the respective disk processors store operation information in the one or more operation information storage memories, and the storage

control system outputs the stored operation information directly to the maintenance terminal via the memory connection section in a form in which the operation information stored in the operation information storage memory is stored in a storage for the maintenance terminal.

LIST OF RELEVANT REFERENCES

The search revealed the following U.S. patents or applications, which are listed for convenience:

<u>U.S. Patent No.</u>	<u>Inventor</u>
6,665,740 B1	Mason, Jr. et al.
6,694,405 B2	Lam et al.
6,810,462 B2	Matsunami et al.

<u>U.S. Patent Application Publication No.</u>	<u>Inventor</u>
2002/0124140 A1	Kawaguchi
2004/0193827 A1	Mogi et al.

Discussion of References:

U.S. Patent No. 6,665,740 B1 to **Mason**, Jr. et al. was assigned to EMC Corporation and is entitled "Logical Volume Selection in a Probability-Based Job Scheduler". **Mason's** data processing system 10 (Fig. 1) has a plurality of host computers 12a-12m connected to a data storage system 14 (Fig. 2) which includes a controller 16, physical storage devices 18a-18k, and buses 20, 22. A console PC 24 (~a maintenance terminal) connects to the controller 16 through a connecting bus 26 and may be used for maintenance and access to the controller 16 (col. 3, lines 54-58). A host computer 12 connects to a port of a plurality of channel adapters 30, each connecting to a global memory 36. Moreover, connected to a global memory 36 are disk adapters 40 for controlling the physical devices 18. The global memory 36 includes data-structures such as operations bit maps 39 which maintain job workload information for the physical devices 18 utilized by controller 16 (col. 3, line 28- col. 4, line 63). However, the PC 24 is connected to the global memory 36 via a bus shared with all the channel adapters 30, rather than via any memory connection section only connecting the maintenance terminal 24 to the global memory 36. Further more, **Mason** does not transfer the operation bitmaps 39 for tracking pending jobs (col. 7, lines 14-36) to the console PC 24 such

that there is no direct transmission of operation information to a storage of the maintenance terminal 24 from the global memory 36. As such, **Mason** does not provide such “a memory connection section 32 for connecting the maintenance terminal to the operation information storage memory 39, and the storage control system outputs the stored operation information directly to the maintenance terminal via the memory connection section 32 in a form in which the operation information stored in the operation information storage memory 39 *is* stored in a storage for the maintenance terminal” as recited in claim 1. In addition, **Mason** does not provide a copy of the operations bit maps 39 stored (not cached) outside of the global memory 36 such that **Mason** does not provide *additional* “one or more operation information storages 59 in which operation information of the storage control system 13 is stored; one or more second disk adapters 43D to be a communication interface with respect to the one or more operation information storages 59, said second disk adapters 43D read out the stored operation information from the one or more operation information storage memories 39 to store the operation information in the one or more operation information storages 59. The storage control system outputs the stored operation information to the maintenance terminal in a form in which the operation information stored in the one or more operation information storages 59 *is not* stored in a storage for the maintenance terminal” as recited in claim 2.

U.S. Patent No. 6,694,405 B2 to **Lam** et al. was assigned to EMC Corporation and is entitled “Method for Analyzing Disk Seek Times in a Disk Array Storage Device”. **Lam**’s data processing system 30 (Fig. 1) is disposed with data storage devices 31A-E, a system memory 32 (including device controllers status 103) with a cache memory 33, device controllers 34A-E, and a host adapter 37. A performance monitor 50 contained in a system manager console 40 retrieves statistics from each cache memory manager on a periodic basis. As each set of statistics is time-stamped and accumulated by each logical volume, the total number of read operations, a read-hit ratio, a sequential-read ratio, and the total number of writing operations over a rest interval can be obtained (col. 4, lines 58-66; col. 7, lines 2-10). As shown in Fig. 1, **Lam** only supports one host 35 such that it does not deploy any “channel adapters to be a communication interface with respect to the host apparatus,” or any “channel processors mounted to the respective channel adapters, one or more disk processors mounted to the respective disk adapters” as recited in claims 1 and 2. Moreover, the system manager console 40 is connected to the device controller 34A, but not to the system memory 32 via a bus shared with all the device controller 34 or via any memory connection section only connecting the maintenance terminal 40 to the system memory 32. Moreover, **Lam** only

retrieves operation statistics (col. 7, lines 1-10) from each cache memory manager 45 in the host adapter 37 on a periodic basis and then transfers the operation statistics to the performance monitor 50 of the system manager console 40 (col. 6, lines 33-44) to be used by a load balance program 51 of the system manager console 40 (col. 7, lines 10-14) such that there is no transmission of operation information to a storage of the maintenance terminal 40 from the system memory 32. As such, Lam does not provide such a “a memory connection section 32” for connecting the maintenance terminal to the operation information storage memory 39, and the storage control system outputs the stored operation information directly to the maintenance terminal via the memory connection section 32 in a form in which the operation information stored in the operation information storage memory 39 *is* stored in a storage for the maintenance terminal” as recited in claim 1. In addition, Lam does not provide a copy of the retrieved operation statistics stored (not cached) outside of the maintenance terminal 40 (including the performance monitor 50) such that Lam does not provide *additional* “one or more operation information storages 59 in which operation information of the storage control system 13 is stored; one or more second disk adapters 43D to be a communication interface with respect to the one or more operation information storages 59, said second disk adapters 43D read out the stored operation information from the one or more operation information storage memories 39 to store the operation information in the one or more operation information storages 59. The storage control system outputs the stored operation information to the maintenance terminal in a form in which the operation information stored in the one or more operation information storages 59 *is not* stored in a storage for the maintenance terminal” as recited in claim 2.

U.S. Patent No. 6,810,462 A1 to Matsunami et al. was assigned to Hitachi, Ltd. and is entitled “Storage System and Method Using Interface Control Device of Different Types”. Matsunami’s storage system 1 (Fig. 1) includes a disk controller (DKC) 11 and storage devices 1700. The disk controller 11 includes channel adapters 1100, 1110, disk adapters (DKA) 1200, a shared memory (SM) 13, a cache memory (CM) 14 and a disk pool manager (DPM) 15. The shared memory 13 stores configuration control information to control the configuration of the storage system 1 and control information of the cache memory 14 (col. 3, line 53 to col. 4, line 21). The DPM 15 is connected to a manager terminal 18 via a communication network 19 and the other devices of the disk controller 11 (col. 6, lines 36-39). However, the manager terminal 18 is connected to the shared memory SM 13 via the DPM 15, rather than via any memory connection section only connecting the manager

terminal 18 to the shared memory 13. Moreover, the manager terminal 18 is provided for a user to input specific settings information (col. 11, lines 59-64) and it receives a termination report from CHNI via the manager 15. **Matsunami** simply does not transfer the termination report to a storage of the manager terminal 18 from the shared memory SM 13. As such, **Matsunami** does not provide “a memory connection section 32 for connecting the maintenance terminal to the operation information storage memory 39, and the storage control system outputs the stored operation information directly to the maintenance terminal via the memory connection section 32 in a form in which the operation information stored in the operation information storage memory 39 is stored in a storage for the maintenance terminal” as recited in claim 1. In addition, **Matsunami** does not provide a copy of the termination report stored (not cached) outside of the DPM 15 (except the manager terminal 18) such that **Matsunami** does not provide *additional* “one or more operation information storages 59 in which operation information of the storage control system 13 is stored; one or more second disk adapters 43D to be a communication interface with respect to the one or more operation information storages 59, said second disk adapters 43D read out the stored operation information from the one or more operation information storage memories 39 to store the operation information in the one or more operation information storages 59. The storage control system outputs the stored operation information to the maintenance terminal in a form in which the operation information stored in the one or more operation information storages 59 is not stored in a storage for the maintenance terminal” as recited in claim 2.

U.S. Patent Pub. App. No. 2002/0124140 A1 of **Kawaguchi** et al. is entitled “Storage System Having Trace Information Fetching Structure and Method of Fetching the Same”. **Kawaguchi** has a controller 20 of a storage system (Fig. 1) which includes a host 10, a personal computer (PC) 40, a cache memory 23, a common memory 24, storages 50-53, a channel controller 21, a channel controller microprocessor 25, a device controller 22, and a device controller microprocessor 26. Each microprocessor is connected to the common memory 24 and the service processor 30. The service processor 30 is a maintenance terminal which functions to issue a maintenance indication to each MP 25, 26 in response to a maintenance operation, and detects information regarding failures taking place in the storage system, and notifies the failures to a maintenance center ([0025]). However, the service processor 30 is connected to the common memory 24 via a bus shared with all the MPs 25, 26, rather than via any memory connection section only connecting the maintenance terminal to the operation information storage memory. Moreover, **Kawaguchi** stores trace information

temporarily in the cache memory 23, and the PC 40 collects the trace information by each MP 25 transfer request to the PC 40 ([0030]) and the service processor 30 collects the trace information by each MP 26 transfer request to the service processor 30 ([0031]). By processing the timing between the MPs comprehensively, the trace information may be useful for the detection of causes of failure and performance analysis ([0039]). In other words, **Kawaguchi** stores the collected trace information first in the cache memory 23, and the trace information is then transferred to a storage of the PC 40 or the maintenance terminal 30 ([0032]), i.e., an indirect rather than direct transmission to a storage of the maintenance terminal from the common memory 24. As such, **Kawaguchi** does not provide “a memory connection section 32 for connecting the maintenance terminal to the operation information storage memory 39, and the storage control system outputs the stored operation information directly to the maintenance terminal via the memory connection section 32 in a form in which the operation information stored in the operation information storage memory 39 *is* stored in a storage for the maintenance terminal” as recited in claim 1. In addition, **Kawaguchi** does not provide a copy of the trace information stored (not cached) outside of the PC 40 or the maintenance terminal 30 such that **Kawaguchi** does not provide *additional* “one or more operation information storages 59 in which operation information of the storage control system 13 is stored; one or more second disk adapters 43D to be a communication interface with respect to the one or more operation information storages 59, said second disk adapters 43D read out the stored operation information from the one or more operation information storage memories 39 to store the operation information in the one or more operation information storages 59. The storage control system outputs the stored operation information to the maintenance terminal in a form in which the operation information stored in the one or more operation information storages 59 *is not* stored in a storage for the maintenance terminal” as recited in claim 2.

U.S. Patent No. 2004/0193827 A1 of Mogi et al. is entitled “Computer System for Managing Performances of Storage Apparatus and Performance Management Method of the Computer System”. **Mogi** employs a management server 120 employed in a computer system (Fig. 1) to monitors an operating state of each system element, a response time onto a job and other information (Abstract). Pre-given information on a process such as a performance requirement the collected monitored information are used by the management server 120 in issuing a command to change allocation of a processing amount to a port, an allocation of a cache area for data, the logical configuration of disc drives and other parameters in order to

carry out the new process or in the case where a result of a judgment based on the monitored information indicates that tuning is necessary (Abstract). **Mogi** determines a record content 522 from the contents of storage port monitored information 382, cache monitored information 370, HDD 16 monitored information, and port monitored information 400. Examples of the record storage content 522 includes an average number of process executions in a port 26 of an I/O path I/F 32 in storage apparatus 40, an average number of executions for each read and write operation in a LU 208, an average hit rate on the read port of the LU 208, and an average utilization ratio for each LU 208 ([0060]; [0130]). There are only a bus between the host computers 70 and the maintenance terminal 120 (Fig. 1). **Mogi** does not have any storage control system (at least including a shared memory) provided between and connected to the host apparatus 70 and the maintenance terminal 120. As such, **Mogi** does not provide “a storage control system connected to a host apparatus and a maintenance terminal, one or more channel adapters to be a communication interface with respect to the host apparatus, one or more channel processors mounted to the respective disk adapters, one or more disk processors mounted to the respective channel adapters, the respective channel processors and the respective disk processors storing operation information in the one or more operation information storage memories” as recited in claims 1 and 2. **Mogi** neither provide such “a memory connection section 32 for connecting the maintenance terminal to the operation information storage memory 39, and the storage control system outputs the stored operation information directly to the maintenance terminal via the memory connection section 32 in a form in which the operation information stored in the operation information storage memory 39 *is* stored in a storage for the maintenance terminal” as recited in claim 1. In addition, **Mogi** does not provide *additional* “one or more operation information storages 59 in which operation information of the storage control system 13 is stored; one or more second disk adapters 43D to be a communication interface with respect to the one or more operation information storages 59, said second disk adapters 43D read out the stored operation information from the one or more operation information storage memories 39 to store the operation information in the one or more operation information storages 59. The storage control system outputs the stored operation information to the maintenance terminal in a form in which the operation information stored in the one or more operation information storages 59 *is not* stored in a storage for the maintenance terminal” as recited in claim 2.

Conclusion

Based on the results of the comprehensive prior art search as discussed above, Applicants contend that the storage control system as now recited in independent claims 1 and 2, especially with the features of “a memory connection section for connecting the maintenance terminal to the operation information storage memory and the storage control system outputs the stored operation information directly to the maintenance terminal via the memory connection section in a form in which the operation information stored in the operation information storage memory is stored in a storage for the maintenance terminal” or “one or more operation information storages in which operation information of the storage control system is stored; one or more second disk adapters to be a communication interface with respect to the one or more operation information storages, said second disk adapters read out the stored operation information from the one or more operation information storage memories to store the operation information in the one or more operation information storages. The storage control system outputs the stored operation information to the maintenance terminal in a form in which the operation information stored in the one or more operation information storages *is not* stored in a storage for the maintenance terminal” are patentably distinct from the cited prior art references.

In particular, as now recited in the claim 1 (for example, the embodiment shown in Figs. 1 & 4; p. 25), the storage control system 13 of the invention which is connected to a host apparatus 1 and a maintenance terminal SVP 11, comprises: one or more channel adapters 35 to be a communication interface with respect to the host apparatus 1; one or more host data storages 3 in which data from the host apparatus 1 is stored; one or more disk adapters 43 to be a communication interface with respect to the one or more host data storages 3; one or more operation information storage memories SM 39 in which operation information of the storage control system 13 is stored; and a memory connection section 32 for connecting the maintenance terminal 11 to the operation information storage memory 39. One or more channel processors CHP 36 are mounted to the respective channel adapters 35. One or more disk processors DKP 44 are mounted to the respective disk adapters 43. The respective channel processors 36 and the respective disk processors 44 store operation information in the one or more operation information storage memories 39. The storage control system 13 outputs the stored operation information directly to the maintenance terminal 11 via the memory connection section 32 in a form in which the operation information stored in the

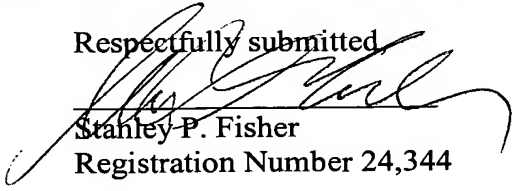
operation information storage memory 39 *is* stored in a storage HDD 7 for the maintenance terminal 11.

The invention (for example, the embodiment shown in Figs. 6-7; pp. 27-28), is also directed to a storage control system 1 which includes all elements recited in claim 1 except the memory connection section 32 for connecting the maintenance terminal 11 to the operation information storage memory 39, and that “the storage control system 13 outputs the stored operation information directly to the maintenance terminal 11 via the memory connection section 32 in a form in which the operation information stored in the operation information storage memory 39 is stored in a storage HDD 7 for the maintenance terminal 11.” Instead, this embodiment includes: one or more operation information storages 59 (Fig. 6; p. 27, lines 19-22) in which operation information of the storage control system 13 is stored; one or more second disk adapters 43D to be a communication interface with respect to the one or more operation information storages 59, said second disk adapters 43D read out the stored operation information from the one or more operation information storage memories 39 to store the operation information in the one or more operation information storages 59. In addition, the storage control system 13 outputs the stored operation information to the maintenance terminal 11 in a form in which the operation information stored in the one or more operation information storages 59 is not stored in a storage HDD 7 for the maintenance terminal 11 (“*a representative DKA 43D connected to the operation information storage 59 reads out operation information stored in an SM 39 and stores the operation information in the operation information storage 59. The operation information stored in the operation information storage 59 is outputted to an SVP 11 in a form in which the operation information is not stored in an HDD 7 of the SVP 11*” Abstract).

In view of all the above, clear and distinct differences as discussed exist between the present invention as now claimed and the prior art references, Applicants respectfully contend that the prior art references cannot anticipate the present invention or render the present invention obvious. Rather, the present invention as a whole is distinguishable, and thereby allowable over the prior art.

Favorable consideration of this application is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicants' undersigned representative at the address and phone number indicated below.

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